

CLAIMS

What is claimed is:

1 1. A method for fine-controlling the position of a predetermined probe location relative to a
2 fixed reference point of a probe processing apparatus fixedly coupled to an auxiliary optical laser
3 apparatus, in which method the position is controlled with optical means, comprising the steps
4 of:

5 presetting said probe location position within a predetermined converging range of $1/4$ of
6 the wave length of the applied fine-controlling positioning laser beam;

7 splitting said positioning laser beam having a linear polarity into a probe beam and a
8 reference beam, whereby a respective optical beam splitting means represents said fixed
9 reference point;

10 polarizing said probe beam and said reference beam in different directions to each other;

11 recombining a beam reflected from said probe location with said reference beam;

12 detecting a phase difference between said reflected beam and said reference beam; and

13 fine-controlling a table supporting said probe, such that the detected phase difference is
14 minimum.

1 2. The method according to claim 1, in which the angle between the polarization of the
2 incoming laser beam and the polarization direction of said reference beam or the probe beam,
3 respectively, is 45° .

1 3. The method according to claim 1, in which the angle between the polarization of the
2 incoming laser beam and the polarization direction of said reference beam or the probe beam,
3 respectively, is selected such that the intensities of reflected probe beam and reference beam
4 when entering the phase detection means are equal.

1 4. The method according to claim 1, in which the steps of splitting said positioning laser
2 beam having a linear polarity into a probe beam and a reference beam, whereby a respective
3 optical beam splitting means represents said fixed reference point, polarizing said probe beam
4 and said reference beam in different directions to each other, recombining a beam reflected from

5 said probe location with said reference beam, detecting a phase difference between said reflected
6 beam and said reference beam and fine-controlling a table supporting said probe, such that the
7 detected phase difference is minimum, are each repeated continuously for a plurality of probe
8 locations while scanning a continuous portion of a probe surface.

1 5. The method according to claim 1, wherein said auxiliary optical laser apparatus performs
2 a fine-controlled auto-focusing of a laser beam associated with said probe processing apparatus.

1 6. The method according to claim 1, in which said auxiliary optical laser apparatus
2 contributes to perform a fine-focusing of a microscope apparatus acting as said probe processing
3 apparatus.

1 7. A method for fine-controlling the position of a predetermined probe location relative to a
2 fixed reference point of a probe processing apparatus fixedly coupled to an auxiliary optical laser
3 apparatus, said apparatus comprising:

4 means for presetting said probe location position within a predetermined converging
5 range of $1/4$ of the wave length of the applied fine-controlling positioning laser beam;

6 means for splitting said positioning laser beam having a linear polarity into a probe beam
7 and a reference beam, whereby a respective optical beam splitting means represents said fixed
8 reference point;

9 means for polarizing said probe beam and said reference beam in different directions to
10 each other;

11 means for recombining a beam reflected from said probe location with said reference
12 beam;

13 means for detecting a phase difference between said reflected beam and said reference
14 beam; and

15 means for fine-controlling a table supporting said probe, such that the detected phase
16 difference is minimum.

1 8. The apparatus according to claim 7 in which said means for splitting said positioning
2 laser beam having a linear polarity into a probe beam and a reference beam, whereby a

3 respective optical beam splitting means represents said fixed reference point and said means for
4 polarizing said probe beam and said reference beam in different directions to each other
5 comprises a polarizing beam splitter.

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1 9. The apparatus according to claim 7, wherein said means for detecting said phase
2 difference comprises:

3 either a quarter-wave-plate or a Babinet-Soleil-Compensator for modifying the polarity of
4 said recombined beam;

5 a polarizing beam splitter post-connected thereto; and

6 a pair of photo detection means, sensing the respective intensity of the split beams for
7 control purposes.